

Express Mail Label No.
EL 886 963 080 US

Date of Mailing JANUARY 23, 2002

PATENT
Case No. GP-301992
(2760/45)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT

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TITLE: METHOD OF TELEMATICS UNIT
CONFIGURATION AND ACTIVATION
USING VEHICLE CONTROL BUTTONS

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METHOD OF TELEMATICS UNIT CONFIGURATION AND ACTIVATION USING VEHICLE CONTROL BUTTONS

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FIELD OF THE INVENTION

This invention relates generally to a method for programming a telematics unit using control buttons. In particular, the invention relates to configuring a
10 telematics unit by using buttons on a control panel of a radio in a mobile vehicle.

BACKGROUND OF THE INVENTION

One of the fastest growing areas of communications technology is related to automobile network solutions. An increasing number of mobile vehicles are
15 being equipped with wireless communication devices, requiring activation keys and new mobile-phone identification numbers, i.e. telephone numbers, to be loaded into a telematics unit of the vehicle. The process of loading a telephone number into the unit should be as efficient and uncomplicated as possible with alternative ways of setting up when preferred methods are unavailable. One
20 preferred process utilizes over-the-air service provisioning (OTASP) specified in TIA/EIA/IS-683-A (1998), "Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Systems." Another way may be through an air interface function (AIF) with a connection directly to a call center. However, OTASP, AIF, or other processes for activating a telematics unit are not always available or
25 desirable.

It would be beneficial to have another process that would load a telephone number into the telematics unit from the motor vehicle without requiring any additional hardware in the motor vehicle or any communications outside the vehicle. In addition to activating the telematics unit, this process would be able to
30 activate other operations modes within the vehicle, such as activating the mobile phone of the vehicle, initiating a phone call, adjusting vehicle parameters, or adjusting features such as temperature, seat-position or comfort settings.

Therefore, it is the object of this invention to provide a method of activating an in-vehicle telematics unit whereby a vehicle user may input a telephone number or other data into the telematics without connections outside the vehicle.

- 5 The method would require no over-the-air service provisioning or air interface connections to a service call center and no additional hardware in a mobile vehicle, thereby addressing and overcoming the obstacles and needs described above.

10 SUMMARY OF THE INVENTION

- One aspect of the invention provides a method of operating a telematics unit in a mobile vehicle. A command signal may be received in response to a radio button activation. A cellular programming mode may be activated in response to the command signal. A mobile phone identification number may be received in response to a radio button activation. An operations mode may be activated in response to the received mobile phone identification number.

The command signal may be sent in response to a depression of a predetermined radio button for a predetermined time period. The predetermined button may be an eject button.

- 20 The mobile phone identification number may be sent in response to a sequence of radio button depressions. A predetermined radio button may be depressed in combination with another predetermined radio button to provide a digit of the mobile phone identification number. A predetermined radio button may be depressed prior to the depression of another predetermined radio button to provide a digit of the mobile phone identification number.

A confirmation signal may be sent in response to receiving the command signal and activating the cellular programming mode. The confirmation signal may comprise a progression tone. The confirmation signal may comprise a digitized voice message.

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The operations mode may include a confirmation mode, a call-ready mode, a call origination mode, a system identification table (SID) update mode, a preferred roaming list update mode, a unit-ready mode, or a vehicle parameter adjustment mode. A predetermined function of the operations mode may be activated in response to a radio button activation.

Another aspect of the current invention is a computer usable medium including a program to operate a telematics unit in a mobile vehicle. The program may include computer program code to receive a command signal sent in response to a radio button activation. The program may include code to activate a cellular programming mode in response to the command signal. The program may include code to receive a mobile phone identification number sent in response to a radio-button activation. The program may include code to activate an operations mode in response to the received mobile phone identification number.

The program may include code to send the command signal in response to a depression of a predetermined radio button for a predetermined time period. The program may include code to send the mobile phone identification number in response to a sequence of radio button depressions.

The program may include code to select the operations mode from a group consisting of a confirmation mode, a call-ready mode, a call origination mode, a system identification table update mode, a preferred roaming list update mode, a unit-ready mode, and a vehicle parameter adjustment mode.

The computer program code may include code to send a confirmation signal in response to receiving the command signal and activating the cellular programming mode. The computer program code may include code to activate a predetermined function of the operations mode in response to a radio button activation.

Another aspect of the current invention is a system for operating a telematics unit in a mobile vehicle. The system may include a means for receiving a command signal sent in response to a radio button activation; a
5 means for activating a cellular programming mode in response to the command signal; a means for receiving a mobile phone identification number sent in response to a radio button activation; and a means for activating an operations mode in response to the received mobile phone identification number.

The system for operating a telematics unit may include a means for
10 sending a confirmation signal in response to receiving the command signal and activating the cellular programming mode. The system may include a means for activating a predetermined function of the operations mode in response to a radio button activation.

The aforementioned, and other features and advantages of the invention
15 will become further apparent from the following detailed description of the presently preferred embodiments, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention rather than limiting, the scope of the invention being defined by the appended claims and equivalents thereof.

20 BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram of one embodiment of a system for configuring and activating a telematics unit in a mobile vehicle by using radio control buttons, in accordance with the current invention; and

25 **FIG. 2** is a flow diagram of one embodiment of a method to configure and activate a telematics unit in a mobile vehicle by using radio control buttons, in accordance with the current invention.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENTS

FIG. 1 shows one embodiment of a system for configuring and activating a
5 telematics unit in a mobile vehicle, in accordance with the present invention at
100.

Telematics unit operational system **100** may contain a mobile vehicle **110**,
a telematics unit **115**, an audio player and radio receiver unit **120**, one or more
wireless carrier systems **140**, one or more communication networks **150**, one or
10 more land networks **160**, and one or more call centers **170**.

Audio player and radio receiver unit **120** may contain on its front radio
panel a main control radio button **122** to turn the unit on and off or control
volume, an eject radio button **124** to eject a compact disk from the opening slit of
compact disk player (CD) **126**, radio display **128**, station or track selector
15 numeric radio buttons **131**, **132**, **133**, **134**, **135**, and **136**, and other control radio
buttons **138** and **139**.

Call center **170** may contain one or more voice and data switches **172**,
one or more communication services managers **174**, one or more communication
services databases **176**, one or more communication services advisors **178**, and
20 one or more bus systems **180**.

Mobile vehicle **110** may be a mobile vehicle equipped with suitable
hardware and software for transmitting and receiving voice and data
communications. Mobile vehicle **110** may contain telematics unit **115** for sending
or receiving voice or data communications. Telematics unit **115** may include, for
25 example, a digital signal processor, a wireless modem, a global positioning
system (GPS) unit, an in-vehicle memory, and a network access device (NAD).
The network access device may be an analog, digital, or dual mode cellular
phone. Telematics unit **115** may be a vehicle communications processor.

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Mobile vehicle **110** may be a mobile vehicle equipped with an audio player and radio receiver unit **120**, which may be any hardware that receives radio signals or data input from media such as compact disks, cassette tapes, digital video device, and portable computer disks. For example, audio player and radio receiver unit **120** may include CD player **126**, audio tape player, clock, and an am/fm radio receiver. Audio player and radio receiver unit **120** may include various radio buttons **124,131, 132, 133, 134, 135, 136, 138, 139** to control, for example, audio volume, balance, band selection, CD track selection, player mode, equalization of output, display lighting, clock setting, memorized channel selections, station selection, input selection, ejection of CD or tape, and other radio or player mode selections.

Telematics unit **115** may be connected by wire to audio player and radio receiver unit **120**. Telematics unit **115** may receive command signals from audio player and radio receiver unit **120** when a radio button or some combination or sequence of radio buttons **124,131, 132, 133, 134, 135, 136, 138, 139** is depressed. These signals may comprise data such as a personal identification number (PIN) or a mobile phone identification number. They may activate a programming mode of telematics unit **115**, whereby a mobile phone identification number may be loaded into telematics unit **115**.

Radio buttons **124,131, 132, 133, 134, 135, 136, 138, 139** may input data to telematics unit **115**, which may in turn control or change other operations modes of the mobile vehicle. These operations modes may include a confirmation mode, a call-ready mode, a call origination mode, a system identification table update mode, a preferred roaming list update mode, a unit-ready mode, and a vehicle parameter adjustment mode.

Telematics unit **115** may send signals to audio player and radio receiver unit **120** to control, for example, outputs of display or audio. Telematics unit **115** may send signals to audio player and radio receiver unit **120** to reset, for example, audio or radio button settings that were functioning before the process of activating telematics unit **115** began.

Mobile vehicle **110** via telematics unit **115** may send and receive radio transmissions from wireless carrier system **140**. Wireless carrier system **140** may be any suitable system for transmitting a signal from mobile vehicle **110** to communication network **150**.

Communication network **150** may comprise services from one or more mobile telephone switching offices and wireless networks. Communication network **150** may connect wireless carrier system **140** to land network **160**. Communication network **150** may be any suitable system or collection of systems for connecting wireless carrier system **140** to mobile vehicle **110** and land network **160**.

Land network **160** may be a public-switched telephone network. Land network **160** may be an Internet protocol (IP) network. Land network **160** may be comprised of a wired network, an optical network, a fiber network, another wireless network, or any combination thereof. Land network **160** may connect communication network **150** to call center **170**. Communication network **150** and land network **160** may connect wireless carrier system **140** to a communication node or call center **170**.

Call center **170** may be a location where many calls may be received and serviced at the same time, or where many calls may be sent at the same time. The call center may be a telematics call center, prescribing communications to and from telematics unit **115** in mobile vehicle **110**. The call center may be a voice call center, providing verbal communications between an advisor in the call center and a subscriber in a mobile vehicle. The call center may contain each of these functions.

Call center **170** may contain one or more voice and data switches **172**. Switch **172** may be connected to land network **160**. Switch **172** may transmit voice or data transmissions from call center **170**. Switch **172** also may receive voice or data transmissions from telematics unit **115** in mobile vehicle **110** through wireless carrier system **140** and communication network **150** and land network **160**. Switch **172** may receive from or send to one or more communication services managers **174** data transmissions via one or more bus systems **180**. Communication services manager **174** may be any suitable hardware and software capable of providing requested communication services to telematics unit **115** in mobile vehicle **110**. Communication services manager **174** may send to or receive from one or more communication services databases **176** data transmissions via bus system **180**. Communication services manager **174** may send to or receive from one or more communication services advisors **178** data transmissions via bus system **180**. Communication services database **176** may send to or receive from communication services advisor **178** data transmissions via bus system **180**. Communication services advisor **178** may receive from or send to switch **172** voice or data transmissions.

Communication services manager **174** may provide one or more of a variety of services, including enrollment services, navigation assistance, directory assistance, roadside assistance, business or residential assistance, information services assistance, emergency assistance, and communications assistance. Communication services manager **174** may transmit data to telematics unit **115** in mobile vehicle **110** through wireless carrier system **140**, communication network **150**, land network **160**, voice and data switch **172**, and bus system **180**. Communication services manager **174** may store or retrieve data and information from communication services database **176**. Communication services manager **174** may provide requested information to communication services advisor **178**.

Communication services advisor **178** may be a real advisor or a virtual advisor. A real advisor may be a human being in verbal communication with a user or subscriber in mobile vehicle **110** via telematics unit **115**. A virtual advisor may be a synthesized voice interface responding to requests from telematics unit **115** in mobile vehicle **110**. Communication services advisor **178** may provide services to telematics unit **115** in mobile vehicle **110**. Services provided by communication services advisor **178** may include enrollment services, navigation assistance, directory assistance, roadside assistance, business or residential assistance, information services assistance, emergency assistance, and communications assistance. Communication services advisor **178** may communicate with telematics unit **115** in mobile vehicle **110** through wireless carrier system **140**, communication network **150**, and land network **160** using voice transmissions, or through communication services manager **174** and switch **172** using data transmissions. Switch **172** may select between voice transmissions and data transmissions.

Telematics unit **115** in mobile vehicle **110** may initiate, for example, a communication services request to call center **170** via wireless carrier system **140**, communication network **150**, and land network **160**. Telematics unit **115** in mobile vehicle **110** may initiate, for example, communications with wireless carrier system **140** in the same geographical region as the mobile vehicle.

FIG. 2 shows a flow diagram of one embodiment of a method to configure and activate a telematics unit system in a mobile vehicle, in accordance with the present invention at **200**. In this telematics unit operational method **200**, radio buttons **124, 131, 132, 133, 134, 135, 136, 138, 139** of audio player and radio receiver unit **120** are used alone or in various combinations or sequences to send signals to request the activation of telematics unit **115**.

Telematics unit **115** in a mobile vehicle may have software defaults set and certain features enabled by the telematics unit manufacturer or retailer before the vehicle delivered to a new user. Telematics unit **115** may be activated at a later time by a vehicle user desiring to receive services from a vehicle communications service provider or a telematics service call center.

The manufacturer or vendor may record the vehicle identification number (VIN), the station identification number (STID) of the vehicle communication processor or unit, the electronic serial number (ESN) of the network access device (NAD), and an authentication key for the vendor, which all may be used to identify the vehicle and telematics unit during the enrollment process with a wireless service provider or call center.

The manufacturer, vendor, dealer or wireless service provider may give the new automobile owner a mobile phone identification number, i.e. a dialable phone number, or mobile directory number (MDN) that may be used to activate telematics unit **115**. The telephone number may be, for example, a generic default mobile station identifier (MSID), which may be a non-portable and non-dialable 10-digit mobile phone identification number (MIN), or a 15-digit international mobile station identifier (IMSI) that is used within land network **160**. The telephone number may be, for example, a clear, non-validating phone number. The telephone number may be for example, in the format of 111-222-1234, which is typical of phone numbers in the United States.

Telematics unit **115** may be activated by depressing predetermined radio button or buttons **124, 131, 132, 133, 134, 135, 136, 138, 139** of audio player and radio receiver unit **120**. Telematics unit **115** may receive a command signal from standard audio player and radio receiver unit **120** when one or more predetermined radio buttons **124, 131, 132, 133, 134, 135, 136, 138, 139** on the head unit or front panel are depressed, and may enter a cellular programming mode, (Block **205**). For example, the request to enter the programming mode may be sent with the depression of eject radio button **124** for ten seconds. The

request to enter the cellular programming mode may be sent with the depression of other predetermined buttons and combinations of buttons for a predetermined length of time. For example, the request to enter the programming mode may be sent with the depression of eject radio button **124** in conjunction with the depression of button **138** for ten seconds. For example, the request to enter the programming mode may be sent with the sequence of depressing eject radio button **124**, radio button **138** and radio button **139**.

Telematics unit **115** may send a request to audio player and radio receiver unit **120** to confirm that telematics unit **115** should be in the cellular programming mode, (Block **210**). The confirmation request or confirmation signal may be a visual or aural alert signal. The confirmation signal may comprise, for example, a single tone, a progression tone or a digitized voice message. A progression tone may be, for example, a series of differently pitched sounds. In return, audio player and radio receiver unit **120** may send back a confirmation acknowledgement to telematics unit **115** in response to a predetermined radio button activation or depression.

Telematics unit **115** may require a mobile phone identification number to be activated. This number may include, for example, a dialable phone number, a mobile directory number (MDN), a generic default mobile station identifier (MSID), a 10-digit mobile phone identification number (MIN), 15-digit international mobile station identifier (IMSI), or a clear, non-validating phone number.

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- Mobile vehicle user may enter a digit of a mobile phone number via depressions of station or track selector numeric radio buttons **131, 132, 133, 134, 135, 136**, (Block **215**). A listing of alphanumeric characters with respective
- 5 predetermined buttons and combinations of buttons may be given to the user through written, radio display, or digitized voice instructions. One example of a mapping algorithm of button combinations and characters is included in Table 1 below.

Table 1

Radio Button Name	Alphanumeric Character Represented
Radio Station 1	1
Radio Station 2	2
Radio Station 3	3
Radio Station 4	4
Radio Station 5	5
Radio Station 6	6
Eject Button + Radio Station 1	0
Eject Button + Radio Station 2	7
Eject Button + Radio Station 3	8
Eject Button + Radio Station 4	9
Eject Button + Radio Station 5	*
Eject Button + Radio Station 6	#

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In this example, eject radio button **124** may act like a shift key of a typical computer keyboard to allow two characters to be represented by one radio button. In cases where there may be fewer than six station or track selector buttons, a second button may act as another shift key. In the example where audio player and radio receiver unit **120** has four station or track selector numeric radio buttons **131, 132, 133, 134**, a set of predetermined button combinations and alphanumeric characters may be represented as in Table 2.

10

Table 2

Radio Button Name	Alphanumeric Character Represented
Radio Station 1	1
Radio Station 2	2
Radio Station 3	3
Radio Station 4	4
Button 138 + Radio Station 1	5
Button 138 + Radio Station 2	6
Button 138 + Radio Station 3	7
Button 138 + Radio Station 4	8
Button 139 + Radio Station 1	9
Button 139 + Radio Station 2	0
Button 139 + Radio Station 3	*
Button 139 + Radio Station 4	#

The manner and sequence in which buttons are depressed may be determined by the mapping of button depressions to specific signals or alphanumeric characters from the manufacturer of telematics unit **115**, manufacturer of mobile vehicle **110**, or designers of software applications used by telematics unit **115**. Radio buttons may be depressed at the same time, one after another with both held, or in sequence to provide a digit in the mobile phone identification number.

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In another example of a mapping algorithm, eject button **124** may be depressed for ten seconds to enter a numerical and character mode where main control radio button **122** may be twisted to the right or left to run through a list of alphanumeric characters that are displayed on radio display **128**. When the mobile vehicle user locates the digit needed for input to telematics unit **115**, radio button **138** may be depressed to send to telematics unit **115** the signal representing the chosen digit. After each entry of a digit with whatever predetermined mapping algorithm has been used, telematics unit **115** may send a confirmation signal to audio player and radio receiver unit **120**, which may send back a confirmation acknowledgement to telematics unit **115** in response to a predetermined radio button activation or depression, (Block **220**). The confirmation signal may comprise, for example, a single tone, a progression tone or a digitized voice message.

When telematics unit **115** has received a sufficient number of digits to constitute a complete telephone number, it may query the mobile vehicle user if the phone number is complete. The telephone number may or may not be complete, (Block **225**). When it is not complete, the process of entering more digits continues, (Block **215**).

When the phone number has been entered completely, telematics unit **115** may send a confirmation signal to audio player and radio receiver unit **120**, which may send back a confirmation acknowledgement to telematics unit **115** in response to a predetermined radio button activation or depression by the mobile vehicle user, (Block **230**). The confirmation signal may comprise, for example, a single tone, a progression tone or a digitized voice message. At this point, telematics unit **115** may exit its cellular programming mode and then enter a unit-ready mode, waiting for a possible signal request for entering other operational modes, (Block **235**). The unit-ready mode may serve as a wait or idle mode.

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Telematics unit **115** may be ready for receiving operation requests via signals sent from a radio button or a combination of radio buttons. The operations mode may be fundamental parameters required for cellular operation such as a mobile phone registration with a wireless carrier or telematics service call center. The operations mode may be, for example, a call-ready mode, a call-origination mode, a system identification table update mode, a preferred roaming list update mode, a unit-ready mode, or a vehicle parameter adjustment mode. The operations modes may include controls for adjusting comfort settings such as seat position, mirror position, or default temperature limits.

The mobile vehicle user may select from a menu one of the operations that may be listed via written instruction, radio display, or digitized voice messages. Selections may be indicated by signals sent with a depression of one or more radio buttons. Which buttons are depressed may be determined by the mapping of button depressions similar to the mappings examples given. One example of mapping a button depression to a requested operations mode may be given in Table 3.

Table 3

Radio Button Name	Operations Mode Requested
Radio Button 1	call-ready mode
Radio Button 2	call-origination mode
Radio Button 3	system identification table update mode
Radio Button 4	preferred roaming list update mode
Radio Button 5	vehicle parameter adjustment mode
Radio Button 6	unit-ready mode

An operation may or may not be selected, (Block **240**). When no operation is selected, telematics unit **115** may remain in a unit-ready operation mode, keeping the unit on ready status, (Block **235**).

When an operation is selected, i.e. the mobile vehicle user may send a operation service request via the depression of one or more radio buttons in a predetermined combination or sequence, and telematics unit **115** may perform
5 the functions of the requested operation, (Block **245**). Alternatively, telematics unit **115** may send a request for a radio button entry to the mobile vehicle user via audio player and radio receiver unit **120**.

The mobile vehicle user may or may not want telematics unit **115** to perform another operation, (Block **250**). When another operation is desired, the
10 additional operation may be selected, for example, by input from a radio button, (Block **240**). When another operation is not desired, telematics unit **115** may return to its unit-ready mode, (Block **235**).

While the embodiments of the invention disclosed herein are presently preferred, various changes and modifications can be made without departing
15 from the spirit and scope of the invention. The scope of the invention is indicated in the appended claims, and all changes that come within the meaning and range of equivalents are intended to be embraced therein.

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